Highlight Projects

- Batting order:
  - Clusters
  - LSS
  - Strong Lensing
  - Supernovae
  - Theory/Joint Probes
  - Weak Lensing
  - Photo-z's

DESC Clusters analysis group key tasks

Task H1—Applegate, Becker, Allen, Wechsler

Estimate the bias in mass calibration of clusters from the shears

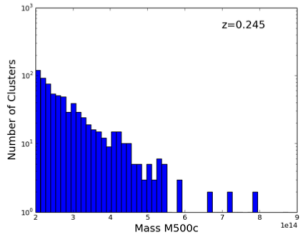
Task H2 --- Dell'Antonio, Clowe

Estimate the bias in the shear measurement compared with the true lensing distortions

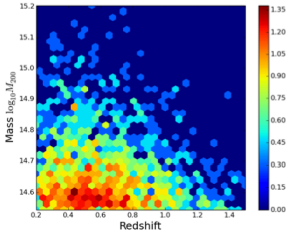
Clusters Task H1

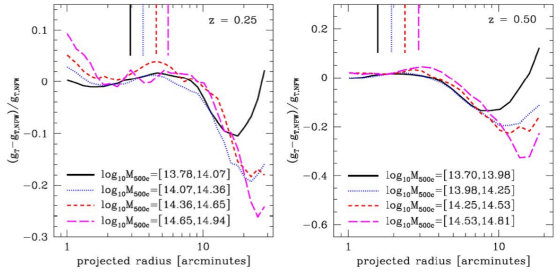
Use simulations and ray-traced shears, compare measured shear with predictions. Analyze simulations in the same way as data. Investigate the sensitivity of bias to choice of shear model and radial fit range.

Becker & Kravtsov 2011



BCC Aardvark (Wechsler et al.)





Becker & Kravtsov 2011

So far, have calculated the rms scatter and the precision to which the bias might be estimated from those sims.

Work to determine bias (and uncertainty in the bias) in Mass and z bins underway. Results in late 2014.

Subsequent developments will include smaller effects to bring this systematic well below 1% in the mass calibration error budget.

Clusters task H2

Shear estimators calibrated in weak shear regime, not true over all cluster field

Shear does not actually measure all the effect on shapes. We need to know how well we measure the signal.

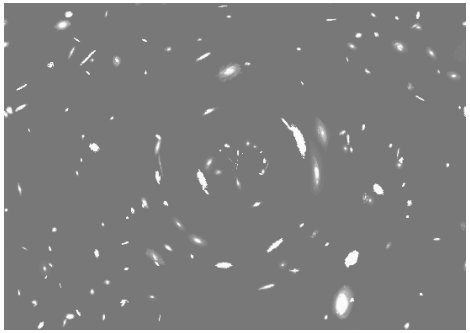
Staged release of simulations.

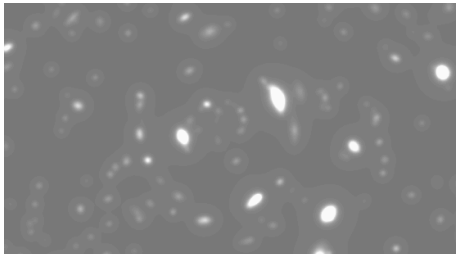
First release planned for end of March– two datasets for release 0. Both datasets: Constant PSF, fixed source redshift, simple cluster model. Datasets convolved with PSFs for LSST, Subaru, DECam, and possibly CFHT.

1) Full images of clusters varying in mass but not in c_{200}. Will test measurement bias versus mass and distortion.

2) Composite images containing postage stamps for galaxies all at the same scaled radial location in the cluster—effectively like a "fixed distortion" sim instead of a fixed shear sim

Plan for a second release in early 2014—currently defining extra level of physics to include (triaxial clusters, cluster galaxies, spatially variable PSF)?





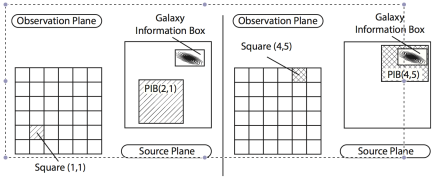
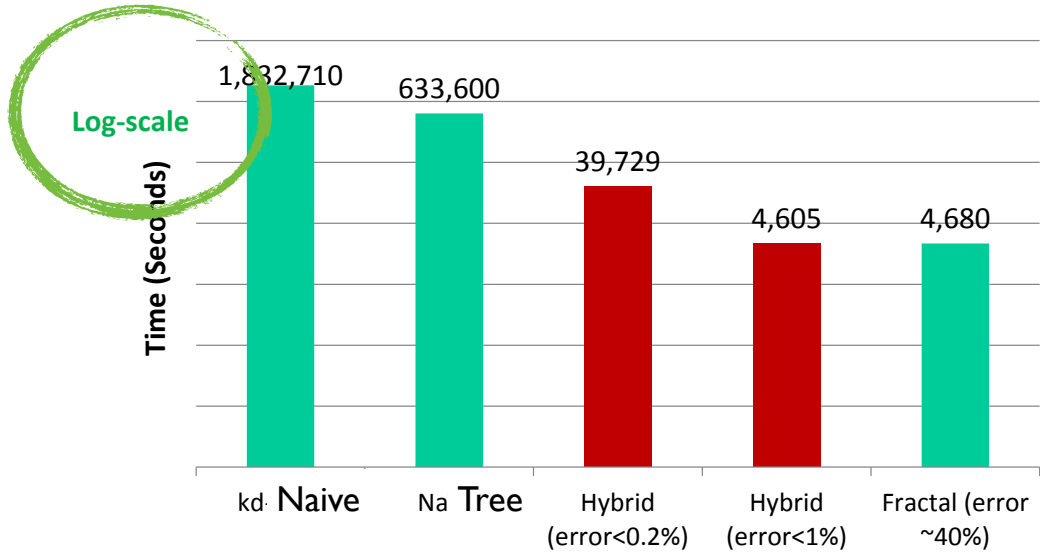


Figure 4: Step 5 of the algorithm for two squares. Left side: case of no intersection between pullback information box and Galaxy information box. Right side: case of intersection.

LSS: Hybrid Method = Sampling + kd-Tree



- Much faster than current techniques: 16 (error <0.2%) - 137 (<1%) times faster! [without using GPU]
- Currently a preliminary version lives on github: https://github.com/berniefu/gpu_sample_correlation_function
- GPU version being tested right now, Hadoop version will be added and will update the documentation.
- user control how much error one is willing to tolerate.
- good for fast computation of correlation functions that you have to do it many many times: covariance matrices computations from random catalogs for example!

LSS Highlight Project: "An Optimal LSST Dither Pattern for Dark Energy Studies"

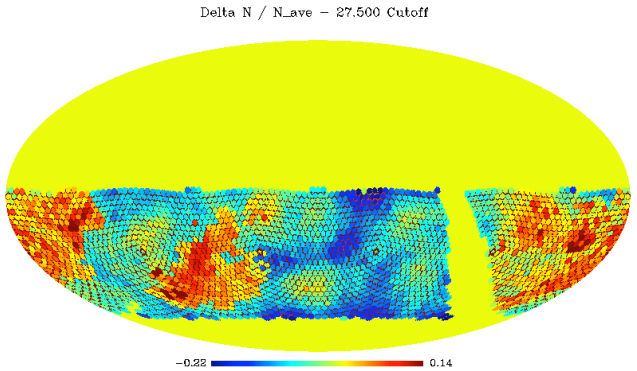
(A Subset of Task CWG-2)

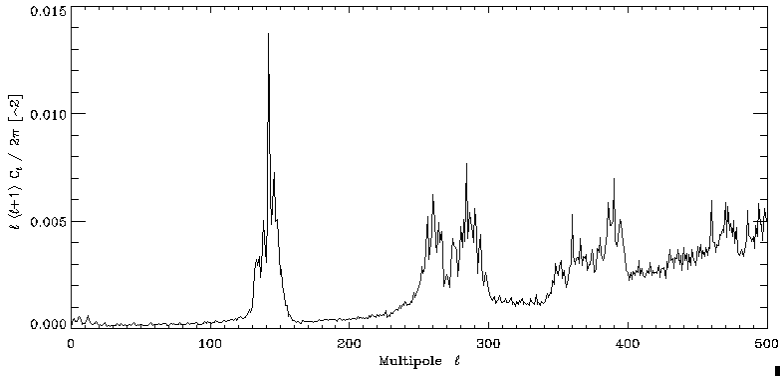
Eric Gawiser, Chris Carroll, Peter Kurczynski, Rachel Bailey, Jean Walker-Soler, Saurabh Jha (Rutgers)

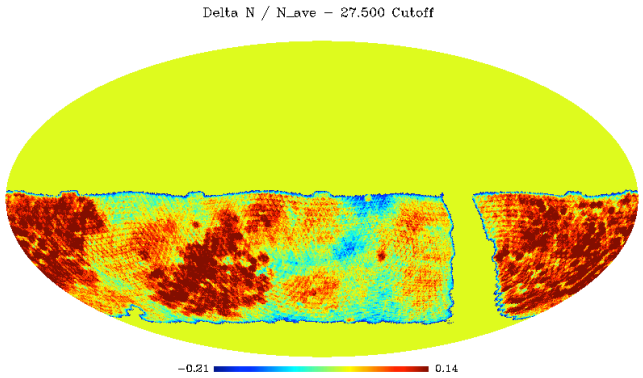
Lynne Jones, Peter Yoachim, Simon Krughoff (U. Washington)

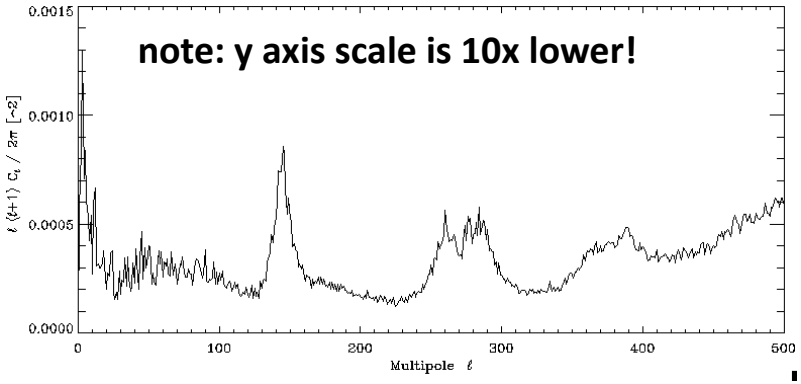
Testing a variety of dithering schemes including rotational dithers to determine their effects on LSS systematics at the BAO scale and larger scales. Please suggest your favorite dithering scheme, and we'll test it!

Bottom line: Big (~ field-of-view) dithers are crucial for Main Survey uniformity.









Plots show the angular power spectrum of δN/<N>. Features at 100<l<300 cause systematic errors in BAO dark energy studies; **big dithers reduce these by a factor of 10!**

Strong Lens Time Delay Challenge

Goals:

1. Assess performance of **current time delay estimation algorithms** on **LSST-like data** (c.f. STEP in WL community)
2. Assess impact of universal cadence strategy on time delay estimation, and possibly recommend changes
3. Support Stage III projects by including COSMOGRAIL-like data

Plan:

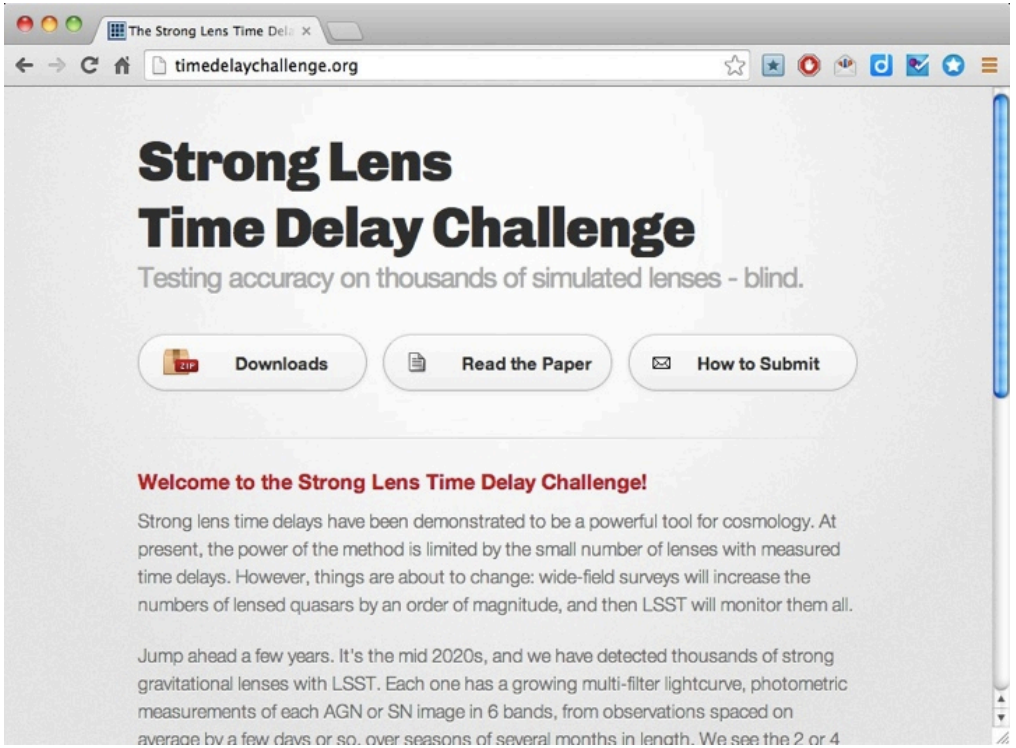
- Generate large set of realistic simulated lightcurves
- Challenge community to infer time delays blindly, and submit results
- Publish paper on results together

Strong Lens Time Delay Challenge

7 groups submitted 24 entries for TDC0 practice set - see SL session this afternoon and plenary tomorrow

TDC1 release date
** December 3rd **

TDC1 deadline: July 1

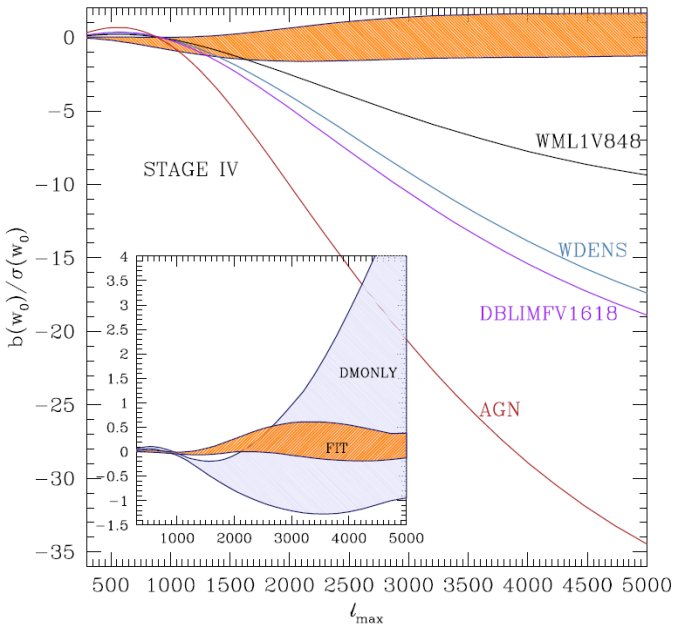


http://timedelaychallenge.org

SNIa Working Group has Three Near-Term Deliverables of Wider Interest

- Generalized cadence simulation and evaluation. (0-3 months)
  - Deep Field Arbitrary Cadence Generator - David Cinabro
    https://github.com/DarkEnergyScienceCollaboration/DeepFieldArbitraryCadenceGenerator
- Supernova realizer for simulations. (3-6 months)
  - SN Realizer framework - Alex Kim
    https://github.com/DarkEnergyScienceCollaboration/SupernovaRealizer
  - SNCOSMO - Kyle Barbary
    https://github.com/sncosmo/sncosmo
- End-to-end calibration simulation and analysis (12 months)
  - PhoSim with realistic atmosphere + aux instrument
  - Rich exchange with other SNIa surveys: DES, SNLS, SDSS, PS1

Theory/Joint Probes Working Group Highlight Project I: Modeling Baryonic Effects



Zentner et al., PRD, 2013

Difference between the distribution of baryons and that of dark matter on small scales is large enough to bias dark energy equation-of-state parameters.

By correcting the halo profile with a fitting of the concentration-mass relation in the simulation, the bias can be greatly reduced.

To Do:

1. Further develop methods to correct for the baryonic effects with multiple observables;
2. Carry out blind analyses of simulations to test and establish robust means of constraining both cosmology and galaxy formation processes.

Theory/Joint Probes Working Group Highlight
Project II:
Cosmological Software

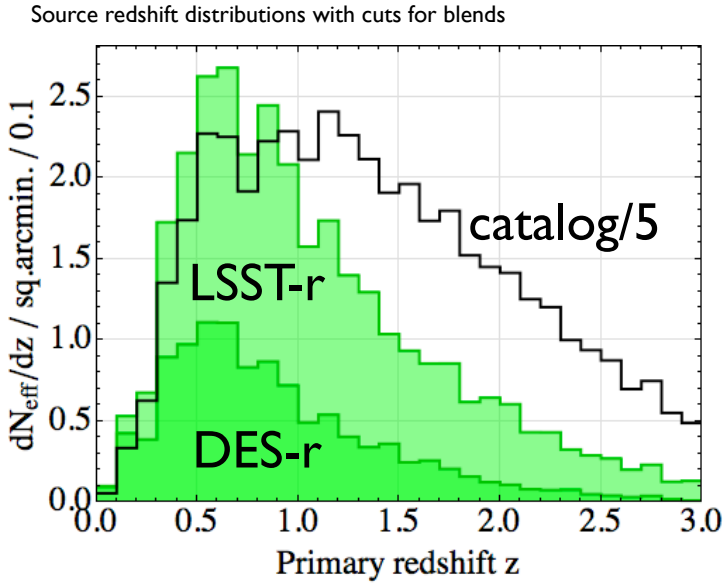
- Package software tools for public release that calculate general dark energy and modified gravity effects on multiple techniques (as part of the broader software effort)

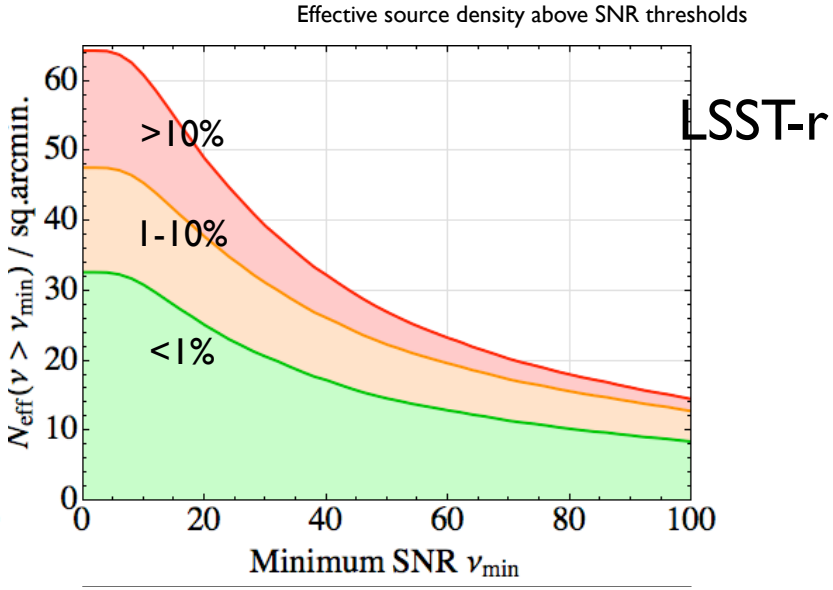
- Enable constraints and forecasting for photometric and spectroscopic surveys and cross-correlations within surveys and the CMB.

- Modular code to allow improvements in photo-z, intrinsic alignment and bias/ stochasticity to be introduced easily with input from the DESC working groups.

Impact of deblending on weak lensing (D. Kirkby)

- Investigation of statistical, systematic errors due to blends
- Includes publicly available code
- Calculations can easily be extended to other surveys, who do have to worry about this problem (to a lesser degree)

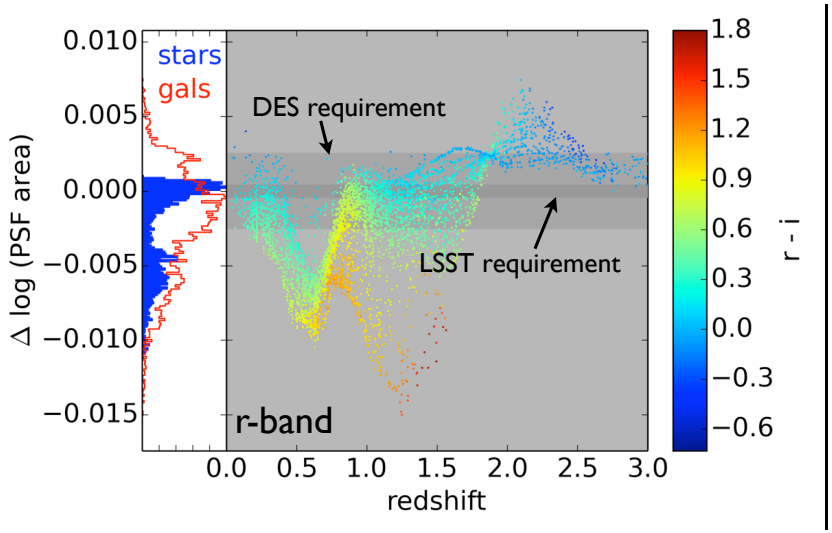




Impact of chromatic effects on weak lensing (Meyers, Burchat, ...)

- Investigation of systematic errors due to chromatic effects in PSFs
  - SED-dependent PSF shape, centroid shift from differential chromatic refraction
  - SED-dependent PSF FWHM from wavelength-dependent seeing
- Includes publicly available code, investigation of mitigation strategies
- Calculations can easily be extended to other surveys, who do have to worry about this problem too

Systematic error



Photometric Redshift Highlight Projects

- Scoping out of spectroscopic survey needs for photo-z calibration: ~30,000 objects over >15 fields, each >20' diameter, to gold sample depth
  - Snowmass white paper, http://arxiv.org/abs/1309.5384
  - Available already, can highlight in March

- Photo-z testbed data set: CFHT LS deep *ugriz* + Subaru deep *y* + DEEP2 redshifts (R<24.1) + DEEP3 redshifts (some up to R=25.5)
  - Need to cross-match and package for public use
  - Can be completed by November

Thursday Parallels

Friday Parallels